



Technology Opportunity

Apparatus and Method for Testing Thermal Performance of Pipelines

The National Aeronautics and Space Administration (NASA) seeks to license its Thermal Insulation Performance Analyzer technology and method to private industry. NASA is also willing to provide industry access to the technology, which was developed at John F. Kennedy Space Center (KSC) Cryogenic Testbed Facility, for testing and consulting purposes. The technology includes testing hardware and a testing procedure that are used to measure the thermal performance of insulated process piping. It was developed for testing the thermal insulation systems of cryogenic pipelines containing fluids like liquid nitrogen used in the launching of the Space Shuttle.

The hardware includes two cold boxes mounted on each end of a section of pipe with a unique flange and bellows feed-through arrangement to allow for the flow of cryogen. The system can accommodate up to three different pipelines in lengths of 60 feet or longer. Also, this testbed can be easily adapted for dynamic testing using not only cryogenics but also chilled water or other working fluids.

Currently there is no standard reference test procedure or device available to industry. KSC's testing technology lends itself very well to the development of an industry standard apparatus and procedure.



Potential Commercial Uses

- Companies involved in the cryogenics industry seeking to test on their thermal insulated pipes. These include manufacturers and service providers for the medical, food storage, aerospace, and semiconductor industries.
- Fuel and oil companies responsible for transferring products like liquid nitrogen and liquified natural gas. Also, offshore oil companies could benefit from this technology because of the need to ensure that oil transferred through pipelines remains warm so the oil does not clump and clog pipes.
- Future energy storage. Superconducting cables in the future may need to be insulated and cooled by liquid

nitrogen. Testing of the piping insulation will be necessary to ensure efficient transfer of the electrical energy.

Benefits

- Enables both static and dynamic testing, technology and method are accurate.
- Provides a direct measurement method based on temperature change and mass flow.
- Determines the true performance of the insulation.
- Saves costs in cryogenic applications by preventing boil-off and providing process control.

Explore. Discover. Understand.

The Technology

The KSC Thermal Insulation Performance Analyzer is fully developed and in use on site at the Cryogenics Testbed Facility. In operation a cooled cryogen is pumped through the upstream cold box into the pipe being tested. Both ends of the pipe are held at a constant temperature, so the heat transfer is eliminated in the axial direction and is limited to the radial direction.

A precise measurement of the rate of heat leak into the process fluid is needed in this process. The technology operates on the theory that the heat leak is equal to the boil-off rate multiplied by the latent heat of vaporization. A heat-leak rate is computed while maintaining the temperature of the cold boxes at the end of the pipe and measuring the boil-off rate.

Thermally isolated valves, plumbing, and safety devices within the cold boxes allow for convenient and efficient controls and a repeatable procedure. All test measurements are recorded on a field-portable data acquisition system with a laptop computer.

Options for Commercialization

NASA seeks qualified companies to commercialize the Thermal Insulation Performance Analyzer technology. This and other technologies are made available by the KSC Technology Commercialization Office through a variety of licensing and partnering agreements. These include patent and copyright licenses, cooperative agreements, and reimbursable and nonreimbursable Space Act Agreements.

Contact

If your company is interested in the Thermal Insulation Performance Analyzer technology and you desire additional information, please reference Case Number KSC-12205 and contact:

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Commercialization Checklist

- ✓ Patent Pending
 - U.S. Patent
 - Copyrighted
- ✓ Available to License
 - Available for no-cost transfer
 - Seeking industry partner for further codevelopment